Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band	)	GN Docket No. 12-354
	)	
	)	

Comments of WiMAX Forum

The WiMAX Forum is not-for-profit industry association that certifies and promotes the compatibility and interoperability of broadband wireless products based upon IEEE Standard 802.16. WiMAX Forum Certified® products are interoperable and support broadband fixed, nomadic, portable and mobile services.

The WiMAX Forum® hereby submits its comments in response to the *Notice of Proposed Rulemaking and Order* (the "*NPRM*") in the above-captioned proceeding of the Federal Communications Commission ("Commission").

Introduction

1. On December 12, 2012 the Commission issued a Notice of Proposed Rulemaking ("NPRM"), under GT Docket 12-354, proposing the creation of a new Citizens Broadband Service ("CBS") sharing the 3550-3650 MHz band with incumbent users, with a supplementary proposal to incorporate the 3650-3700 MHz band under the new regulatory regime.
2. The WiMAX Forum supports the Commission's efforts to further the overall efficiency of usage within this spectrum band by means of the two proposed techniques: small cells and spectrum sharing.

WiMAX Technologies and IMT in the band 3500-3700 MHz

3. As noted in the NPRM (¶1), the 3.5 GHz Band was identified by the National Telecommunications and Information Administration (NTIA) for shared federal and non-federal use in the 2010 Fast Track Report[1]. As noted in the NPRM (¶6), "The Fast Track Report's recommendations for the 3.5 GHz Band were based on an assessment of commercial deployment of (WiMAX)[2] equipment in the band."
4. As noted in the NPRM (¶28), the 3650-3700 MHz band is also allocated for terrestrial non-Federal use. Wireless Broadband Services in that band are authorized through non-exclusive nationwide licenses requiring the registration of individual fixed and base stations. All stations operating in this band must employ a contention-based protocol. The NPRM (¶29) reports 2,117 licensees with more than 25,000 registered sites throughout the United States as of October 2012. It refers (¶125) to the assumption in the 3650-3700 MHz rulemaking "that Commercial Mobile Radio Services licensees would operate high-powered WiMAX devices."
5. As noted in the NPRM (¶29), the 2007 World Radiocommunication Conference (WRC-07) identified the 3400-3600 MHz band for International Mobile Telecommunications (IMT) in much of ITU Region 1 and in areas within ITU Region 3.
6. World Radiocommunication Conference resolutions (such as WRC-12 Resolution 223) specify that that "IMT" incorporates IMT-2000 and IMT-Advanced. The IMT-2000 recommendation (ITU-R M.1457) incorporates the WirelessMAN-OFDMA air interface specification of IEEE Std 802.16[3], as incorporated in WiMAX[4]. The IMT-Advanced recommendation (ITU-R M.2012) incorporates the WirelessMAN-

[1] NTIA, *An Assessment of the Near-Term Viability of Accommodating Wireless Broadband Systems in the 1675-1710 MHz, 1755-1780 MHz, 3500-3650 MHz, 4200-4220 MHz, and 4380-4400 MHz Bands* (Oct. 2010) <http://www.ntia.doc.gov/files/ntia/publications/fasttrackevaluation_11152010.pdf>

[2] Note that the Fast Track Report incorrectly reports that the term "WiMAX" is an abbreviation for "Worldwide Interoperability for Microwave Access"; WiMAX® is in fact a registered trademark of the WiMAX Forum and is not an abbreviation.

[3] IEEE Std 802.16-2012: *Air Interface for Broadband Wireless Access Systems* <http://ieee802.org/16/pubs/80216.html>

[4] http://www.wimaxforum.org/resources/itu/wimax-imt-2000

Advanced air interface specification of IEEE Std 802.16.1[5], as incorporated in WiMAX Forum Specification T28-001-R020v01[6].

7. In many countries, the band 3600-3800 MHz is also being considered for IMT. For example, a European Commission decision 2008 moved to harmonize the entire 3400-3800 MHz band[7]. The CEPT (European Conference of Postal and Telecommunications Administrations) Electronic Communications Committee in 2011 agreed on a harmonized TDD (Time Division Duplex) frequency arrangement in the 3600-3800 MHz band, moving to provide "a contiguous 400 MHz of radio frequency spectrum" to "a unique opportunity to meet some of the new demands for mobile broadband."[8]
8. Many in the industry worldwide are viewing the 3.5 GHz band as favorable for small-cell operations. In February 2013, ITU-R Working Party 5D (which develops and maintains IMT specifications) began preliminary drafting of a "Compatibility study between FSS networks and IMT systems in the band 3 400-3 600 MHz for small cell deployments."
9. The IEEE 802.16 Working Group began, in January 2013, to develop Project P802.16r[9] to enhance the WirelessMAN-OFDMA air interface (used in Mobile WiMAX) for application to Small Cell Backhaul. The work addresses small cell base stations that are fixed or nomadic and may support mobile devices. The backhaul band is presumed to be below 6 GHz and distinct from the mobile band of the small cell. The existing IEEE 802.16 point-to-multipoint architecture will be maintained, with a single P802.16r base station supporting multiple small cells, without a line-of-sight requirement.
10. The P802.16r project will utilize standardized Carrier Ethernet transport connectivity

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[5] IEEE Std 802.16.1-2012: *WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems* <http://ieee802.org/16/pubs/802161.html>

[6] http://www.wimaxforum.org/sites/wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf

[7] *On the harmonisation of the 3 400-3 800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community*, EC Decision 2008/411/EC <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008D0411:EN:NOT>.

[8] "ECC opens up major bandwidth for mobile broadband in 3.4-3.8 GHz*," ECC Newsletter*, Feb. 2012 <http://apps.ero.dk/eccnews/feb-2012>

[9] *IEEE 802.16's P802.16r Project: Small Cell Backhaul with Ethernet* <http://ieee802.org/16/scb>

to backhaul small cells. The user side of the small cell can support arbitrary radio technologies, such as LTE, Wi-Fi, Mobile WiMAX, etc.

11. By utilizing standardized Carrier Ethernet transport, the P802.16r project will provide support not only for small cells but also for a variety of industrial applications, such as oil and gas field communications, Smart Grid communications, and other utility applications. All of these could readily be deployed in the 3.5 GHz band under a suitable regulatory scenario.
12. For these reasons, we believe that the significant trend in industry as well as within worldwide regulatory bodies is to view the 3400-3800 MHz band as a core band for future deployments of WiMAX and other 4G technologies for fixed and mobile broadband, including small cell deployments and backhaul.
13. We believe that the Commission's effort to provide additional opportunities for IMT-like technologies in the 3.5 GHz band are consistent with these worldwide trends and will leverage the resulting synergies and economic efficiencies.

Unnecessary restrictions in the band 3650-3700 MHz

14. WiMAX technologies have been widely deployed in the 3650-3700 MHz band, as discussed above. However, such deployments have been restrained by regulatory limitations.
15. Deployment of equipment is significantly restrained by the excessive 150 km exclusion zones surrounding grandfathered FSS earth stations FSS earth stations.
16. Deployment of WiMAX equipment is also hampered by failure to account for the fact that WiMAX technology provides a point-to-multipoint architecture in which subscriber stations, whether fixed or mobile, are under the control of a base station.
17. The regulations (Part 90, Subpart Z)[10] require that a "licensee cannot operate a fixed or base station before registering it under its license" (47 C.F.R. § 90.1307). However, they also allow (47 C.F.R. § 90.1333) mobile and portable stations "only if they can positively receive and decode an enabling signal transmitted by a base

[10] 47 C.F.R. § 90 (Title 47: Telecommunication, Part 90: Private Land Mobile Radio Services, Subpart Z: *Policies governing the use of the 3650-3700 MHz band*) <http://www.ecfr.gov>

station."

18. We introduce the term "subsidiary stations" in this document to refer to stations that operate under control of an enabling signal transmitted by a base station. The language of 47 C.F.R. § 90.1333 appropriately recognizes the principle that a subsidiary station need not be subject to the same restrictions as the base station itself.
19. Unfortunately, Part 90, Subpart Z recognizes the subsidiary station concept only with regard to mobile and portable stations. *Fixed* subscriber stations are subject to the same requirements as base stations, including the requirement that the subscriber station be registered. The requirement to register each fixed subscriber station in the FCC's public Universal Licensing System (ULS) database is a major deterrent to deployment; aside from the administrative burden, it violates the demands of both the operator and the subscriber to maintain privacy regarding the nature of the subscription services provided to private addresses.
20. The WiMAX Forum proposes a broader recognition of the opportunity to reduce restrictions on all subsidiary stations, fixed as well as mobile. We return to this concept below.
21. In the case of the 3650-3700 MHz band, we urge the Commission to remove the requirement for ULS for all subsidiary stations, fixed as well as mobile.

Small Cell deployment demands wireless backhaul

22. The WiMAX Forum endorses the view of the NPRM, and of its cited PCAST Report[11], that increased use of small cell network deployments will enhance capacity within existing spectrum resources by taking advantage of spatial reuse.
23. High-capacity deployments demand high-capacity backhaul. Small-cell deployments demand *distributed* high-capacity backhaul. To provide efficient service, small cells must be located according to capacity demands, not only according to wireline backhaul availability. In an effective small cell deployment, a *wireless* backhaul

[11] PCAST, *Report to the President: Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth* (rel. July 20, 2012) <http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf>

system, in which the small cell backhaul connectivity is wireless, will allow cells to be sited without regard to wired connectivity.

24. Since fixed/nomadic wireless technology is well suited to providing distributed backhaul, and since mobile spectrum is best used for access rather than for backhaul, we urge the Commission to consider fixed/nomadic backhaul spectrum as a critical element of the small-cell deployment scenario.

The WiMAX Forum supports the use of a spectrum access system (SAS) with provision for subsidiary stations

25. The WiMAX Forum supports the NPRM's proposal to enable sharing based on a spectrum access system (SAS) incorporating a dynamic geolocation database.
26. Many radio systems (such as WiMAX and LTE systems) will operate as base station communicating with subsidiary stations that (as defined in paragraph 18 above) operate under control of an enabling signal transmitted by a base station.
27. The WiMAX Forum urges the Commission to specify that subsidiary stations need not communicate directly with the SAS but can instead operate under the control of a base station that communicates with the SAS directly or indirectly.
28. Thus, for example, and LTE handset may operate under the control of an LTE small cell base station. If the small cell base station controls the transmission of the handsets and is configured so as to be controlled (directly or indirectly) by the SAS, then the handsets should not be required to directly access or respond to the SAS. Such indirect control could be provided over the (wired or wireless) link providing backhaul to the small cell base station.
29. The WiMAX Forum does not object to mitigation techniques such as beaconing, but it has serious concerns regarding a mandate of individual devices to sense and respond to beacons. Given that devices will be responsive to a SAS, we believe it would be incumbent for the generator of the protective beacon to provide sensor technology to sense the beacon and insert information into the SAS database accordingly. This would allow the individual devices to refer to the SAS database alone for information about current usage among the Incumbent and Priority Access

users, without being forced to bear the capital expense and electrical-power burdens of operating a sharing receiver.

The WiMAX Forum generally supports the supplemental proposal to incorporate the 3650-3700 MHz band into the proposed regulatory regime

30. The NPRM's offers a "Supplemental Proposal to Include the 3650-3700 MHz Band" (¶77-82).
31. Generally speaking, the WiMAX Forum supports the NPRM's supplemental proposal for the 3650-3700 MHz band.
32. The existing non-exclusive, nationwide licensing system has been reasonably effective, although we have concerns (stated above) regarding the need for more flexibility in the regulations.
33. The spectrum access system (SAS) proposed in the NPRM could provide a more definitive and effective solution to the problem addressed by the contention-based protocol requirements, while also allowing geographically broader deployments consistent with appropriate protection.
34. The proposed license by rule framework (¶63) would streamline deployment as compared to the "light licensing" scenario of the current 3650-3700 MHz band, particularly with its onerous requirement to register each fixed device.
35. We believe that the 150 MHz contiguous block would be in the public interest. We support the view (¶80) that "the utility of the band could increase, attracting new operators and encouraging the development of a larger equipment market" and that "economies of scale could drive down the price of equipment for current 3650-3700 MHz licensees and future Citizens Broadband licensees, making it more affordable for new and existing operators to expand their service offerings."

Incorporation of the 3650-3700 MHz band into the proposed regulatory regime

36. As noted previously, the WiMAX Forum generally supports the NPRM's "Supplemental Proposal to Include the 3650-3700 MHz Band" (¶77-82).
37. The WiMAX Forum agrees with the observation (¶81) that such a transition "would

likely entail equipment upgrades and technology conversion" and urges the Commission to take these into consideration. We recommend a three-year transition period.

38. The current out-of-band emission limit in the 3650-3700 MHz band (43+10log P dB at the edge of the authorized licensed block, as noted in (¶137)) is appropriate for consideration for the 3550-3650 MHz CBS band.
39. As noted earlier, fixed/nomadic wireless backhaul should be considered as a necessary element of a small-cell deployment scenario. If small-cell deployment flourishes in the 3550-3650 MHz band under the proposed rules, then the "lightly-licensed" 3650-3700 MHz band could become significantly deployed for backhaul service of those same small cells.
40. We suggest that, if the Citizens Broadband Service emerges under the proposed three-tier shared access model, then backhaul of small cells be granted Priority Access status in the 3650-3700 MHz band.

Conclusion

41. The WiMAX Forum endorses proposed Citizens Broadband Service in the 3550-3650 MHz band, with appropriate regulatory support to allow that service to flourish. The WiMAX Forum endorses the supplementary proposal to include the 3650-3700 MHz band into the new proposed regulatory regime, incorporating opportunities to support the backhaul of fixed and nomadic small cells.

Respectfully submitted,

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